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M. V. Balakir, PhD student (BSTU)

DYNAMICS OF COMMODITY STRUCTURE OF ARTIFICIAL SPRUCE STANDS IN SORREL AND BRACKEN WOODS

In this work the dynamics of the commodity structure of the table stands for the qualitative evaluation of artificial spruce stands of different initial density according to forest types that will improve the accuracy of the material and the level of assessment of forest management planning of forest management spruce crops in Belarus. Found that artificial spruce stands of different initial density have certain features of the dynamics of assortment structure.

Introduction. The natural regeneration of Norway spruce on the territory of Belarus isn't effective in all cases: under the forest crown cover it is reasonably successful, but not so well in the logged areas. In this regard the forestry is aimed at creation of artificial cultures as a more active way of reforestation.

In the modern conditions of the forest management, the main aim for wood-growers is to increase forest stands productivity, to satisfy the requirements of the national economy for wood and related forest production. To reach these targets it's necessary to obtain regulatory reference information that characterizes condition and development of the forestry. Accordingly, forestry reference data has to reflect precisely forest condition and qualitative composition.

The tables of dynamics of forest stands commodity structure characterize the changes of stands value with age. The tables of this kind are necessary in forest management, in forestry planning to determine felling age according to assortment requirements.

Nowadays for growing stock commodification in the conditions of Belarus, we use the tables of value dynamics based on bonitet class and ignoring stands origin. The materials that consider the origin and soil type of the growing stock more fairly present commodity structure dynamics.

The goal of this work is to work out the tables of the dynamics of the commodity structure of artificial spruce stands in sorrel and bracken woods in the conditions of Belarus**.**

Main part. To perform the estimation of dynamics of artificial spruce stands commodity structure, the experimental material was collected on the territory of 13 state forestry establishments: Slutsky forestry station, Tolochinsky forestry station, Mogilevsky forestry station, Orshansky experimental forestry station, Logoysky forestry station, Smorgonsky experimental forestry station, Vitebsky forestry station, Uzdensky forestry station, Volkovyssky forestry station, Minsky forestry station, Gluboksky experimental forestry station, Postavsky forestry station, and Smolevichsky forestry station. The commodity structure dynamics was analyzed on the 60 plots, laid out by the author.

The plots were laid out in the even-aged artificial spruce stands in sorrel and bracken woods, pure and relatively pure (containing less than 20% of other wood species). When plots for planting spruce were chosen, it was necessary for the areas to be of the same biological and typological signatures, and differ only in the age [1]. The natural growth dynamics was determined by analyzing the growing course of test trees and dynamics of the stand height. The most large-sized trees were selected for test trees, because in the past they didn't lag behind in growth, weren't choked up by larger trees, and consequently had developed normally, and their growth depended only on the habitat conditions [2].

All the plots were divided into two groups of initial density within spruce stands in sorrel and bracken woods. High-density group included stands with the initial density of 5.0–9.9 thousand pcs/ha. The thinner stands were included in the low-density group.

Test material processing was carried out using computers. The material analysis of the test areas was performed using assortment tables by F.P. Moiseenko [3].

WSP program by V.P. Mashkovsky was used to smooth the inventory data, which helped to minimize the subjectivity of graphical fitting of test data, and relieved from the necessity to find the function that displays the analyzed correspondence [4].

The dynamics of commodity structure of artificial spruce stands was worked out for sorrel and bracken woods and includes age rate from 40 to 90 years (sorrel woods); for the bracken woods, because of few test material, the age rate in the tables is limited by 80 years (Tables 1, 2).

The data in Table 1 indicate high general value of spruce stands in sorrel woods, merchantable wood yield at the felling age makes about 91%. It should be noticed that woods of low density had structure of higher quality throughout all the period. At the age of 90 the yield of large-sized commercial wood in these stands was higher by 9.0% than in the cultures growing in high-density group. In the low-density group in the 3rd class of age average commercial wood was more by

0.3−1.8%. But yield of small wood was higher in high-density group.

Due to the fact that the analyzed forest stands have different total yield dynamics, the commodity structure estimation in the relative values can't characterize forest stand in total. That's why we calculated the value in absolute values guided by total productivity of spruce stands (Tables 1, 2).

Merchantable wood yield was higher in high-density group, but by the mature age there was no significant difference between the groups. Low-density spruce stands throughout the period of growth have produced more large-sized woods than high-density ones. By the age of 90 years the difference had made 62 m^3.

Spruce cultures of sorrel type can be characterized as highly valuable; merchantable wood yield varies from 87.7 to 90.0% in high-density plots and from 87.7 to 90.5% in low-density ones. The obtained data shows that high-quality wood yield is higher in low-density areas. This difference tends to widen, and by the maturity age it makes 15.8%. It bears mentioning that waste wood quantity in low-density sorrel woods is less than in high-density ones.

In the course of research on commodity structure of bracken spruce woods, it was calculated in absolute values that the thinner the plantation, the more the yield of large-sized commercial wood. For example, at the age of 80 years low-density plots have 274 m^3/ha of large-sized commercial wood, it's 60 m^3/ha more than the other group of plots. Bit on the whole a higher quantity of commercial wood yield can be obtained from high-density stands.

Table 1

Dynamics of commodity structure of spruce stands with different initial density in sorrel woods , %/m^3

Age, years	Mean height, m	Mean diameter, cm	Commercial wood				Firewood	Merchantable	Waste
			large	medium	small	total			
Dense species									
40	19.2	18.4	1.5 5	44.4 155	38.6 134	84.5 294	4.4 15	88.9 309	11.1 39
50	22.4	22.1	10.6 49	51.6 239	23.5 108	85.7 396	3.9 18	89.6 414	10.4 48
60	25.0	25.3	23 129	50.6 283	13.3 74	86.9 486	3.3 18	90.1 504	9.9 55
70	27.1	28.0	35.5 227	45.1 289	7.3 47	87.8 563	2.8 18	90.6 581	9.4 60
80	28.8	30.3	46.3 329	37.8 269	4.4 31	88.5 629	2.4 17	90.9 646	9.1 64
90	30.3	32.2	55.2 424	30.6 235	3.2 25	89.1 684	2.1 16	91.2 700	8.8 68
Rare species									
40	19.8	18.9	2.9 8	45.7 130	35.9 102	84.6 241	4.5 13	89.1 254	10.9 31
50	23.1	23.2	15.4 62	53 212	18 72	86.5 346	3.3 13	89.8 359	10.2 41
60	25.8	26.9	29.2 148	49.4 250	9.1 46	87.8 443	2.7 13	90.4 457	9.6 48
70	27.9	30.0	42.7 256	40.5 243	5.3 32	88.5 530	2.4 14	90.9 544	9.1 55
80	29.7	32.7	54.7 373	30.4 208	3.9 27	89.0 607	2.2 15	91.2 622	8.8 60
90	31.2	35.0	64.2 486	22.1 167	2.9 22	89.3 675	2.2 17	91.5 692	8.5 64

Table 2

Dynamics of commodity structure of spruce stands with different initial density in bracken woods, %/m^3

Age, years	Mean height, m	Mean diameter,cm	Commercial wood				Firewood	Merchantable	Waste
			large	medium	small	total			
Dense species									
40	15.3	13.6	0.2 0	29.0 77	53.1 142	82.2 219	5.5 15	87.7 234	12.3 33
50	18.8	17.7	3.8 15	44.3 170	35.6 137	83.7 322	4.8 18	88.5 341	11.5 44
60	21.8	21.4	10.6 52	52.4 257	22.3 109	85.2 418	3.9 19	89.1 437	10.9 53
70	24.2	24.7	20.4 118	52.6 305	13.5 78	86.5 501	3.1 18	89.7 519	10.3 60
80	26.3	27.6	32.7 214	45.3 297	9.1 60	87.1 571	2.9 19	90.0 590	10.0 66
Rare species									
40	16.1	15.7	0.2 1	33.3 69	46.0 95	79.5 165	8.1 17	87.7 181	12.3 26
50	19.4	19.9	5.8 18	44.3 136	32.7 100	82.9 254	6.4 20	89.2 273	10.8 33
60	22.1	23.6	16.1 65	48.8 196	20.0 80	84.9 340	5.1 20	90.0 361	10.0 40
70	24.3	26.9	30.4 148	45.1 220	10.9 53	86.3 421	4.2 20	90.5 442	9.5 46
80	26.2	29.7	48.5 274	30.8 174	7.5 42	86.7 491	3.7 21	90.5 512	9.5 54

Conclusion. In this paper, tables of the dynamics of the commodity structure stands for a qualitative assessment of artificial spruce stands of different initial density according to forest types are compiled , which will improve the accuracy of the material evaluation and design level Forest Inventory forest activities spruce crops in Belarus. Found that artificial spruce stands of different initial density have certain features of the dynamics of assortment structure. In the spruce forest type Kislichnaya cultures throughout the ages represented by sparse cultures have a better structure. At the age of maturity rarely yield large crops of industrial wood by 9.0% more than in gustyh. Elovye culture fern forest types are also characterized by high market yield liquid timber varies 87.7–90.0% in dense cultures and 87.7–90.5% rare.

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